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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,035	10/31/2003	Naoto Jikutani	242058US2CIP	1110

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EXAMINER
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MENEFEE, JAMES A

ART UNIT	PAPER NUMBER
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2828

DATE MAILED: 10/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/697,035

Applicant(s)

JIKUTANI ET AL.

Examiner

James A. Menefee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 63,64,66-69,71-75,77 and 78 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 63,64,66-69,71-75,77 and 78 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/25/06</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Amendment*

By amendment filed 8/2/2006, claims 1-62, 65, 70, 76, and 79-125 are cancelled, and claims 63, 66, 68, 73, 74, and 77 are amended. Claims 63-64, 66-69, 71-75, and 77-78 are pending.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 63, 66-68, 71-73 are rejected under 35 U.S.C. 102(e) as being anticipated by Villareal et al. (US 6,850,548).

Regarding claims 63 and 68, Villareal discloses a DBR (and a surface emitting laser using such a DBR) comprising an alternate stacking of first and second semiconductor layers having different refractive indices, and a plurality of intermediate layers (transition regions in Villareal) each sandwiched between a first and a second semiconductor layer. See, e.g., abstract first sentence. The first and second semiconductor layers are GaAs and AlAs, and the intermediate layers are  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  and therefore the intermediate layers have a refractive index intermediate between that of the semiconductor layers. See Table 1 on col. 6. The intermediate layers in a first region of the DBR have a thickness different from intermediate layers in a

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different region of the DBR. See col. 6 lines 21-23. The transition regions (i.e. intermediate layers) have different thicknesses and doping concentrations within said DBR corresponding to an electric field strength within the DBR. Col. 5 line 50 – col. 6 line 2.

Regarding claims 66 and 71, in the transition regions (i.e. intermediate layers) the thickness is higher and doping concentration lower where the electric field strength is large, and the thickness is lower and doping concentration higher where the electric field strength is small. Col. 5 line 50 – col. 6 line 2.

Regarding claims 67 and 72, the DBR is for use at 1310 nm, falling within the range as claimed. Col. 6 lines 10-11.

Regarding claim 73, the active layer 20 is formed of AlGaAs, thus including the elements as claimed. Col. 4 lines 49-50.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 64, 69, and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Villareal in view of the admitted prior art.

Regarding claims 64 and 69, Villareal discloses the limitations of parent claims 63 and 68 as noted above. Regarding claim 75, the limitations of parent claim 74 are taught as noted below. It is not disclosed that a difference in bandgap between the first and second semiconductor layers

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is smaller in a region where the intermediate layer has an increased thickness than in a region where the intermediate layer has a reduced thickness.

The admitted prior art (see specification p. 19-21) teaches that the bandgap difference between the semiconductor layers of a DBR may be reduced in the region where doping is lower. It would have been obvious to one skilled in the art to do this in Villareal's laser so that electrical resistance in the DBR may be further reduced, as taught by the admitted prior art. The region of Villareal's DBR where doping is lowest is the region where the intermediate layer has an increased thickness, see rejection of claim 66 above, therefore making this obvious change will meet the claim limitations.

Claims 74 and 77-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Villareal. Villareal discloses the limitations of the claims as in the above rejections of claims 68 and 71-72. It is not disclosed that there is an array of surface emitting lasers. But it is well known in the art that a plurality of surface emitting lasers may be formed in an array. It would have been obvious to one skilled in the art to form a plurality of Villareal's surface emitting lasers in an array so that higher output power may be achieved, as is known.

### ***Response to Arguments***

Applicant's arguments filed 8/2/2006 ("Remarks") have been fully considered but they are not fully persuasive.

Applicant notes that the pending claims are supported in applicant's specification in the present application. Remarks at 7. The examiner agrees. In the prior action, the examiner had

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noted that there did not appear to be support for these claims in the parent case, therefore the effective filing date would be that of the present application, 10/31/2003. This point has not been rebutted, therefore the examiner still examines this application using 10/31/2003 as the effective filing date.

Applicant notes that the prior rejections under 35 U.S.C. 102(b) based on Jewell are now moot. Remarks at 7. The examiner agrees, and such rejections are withdrawn.

Applicant argues that Villareal does not teach or disclose all of the limitations of the independent claims, namely the limitations of cancelled dependent claims 65, 70, and 76. The argument is not persuasive. Applicant notes various features disclosed in applicant's specification and describes how this provides benefits not described in Villareal. Remarks, ¶ bridging pp. 9-10. However, such features are not read from the specification into the claims, and Villareal's disclosure meets the limitations of the claims. Even so, such benefits do appear to be found in Villareal.

As described in the rejections above, Villareal's transition regions correspond to the "intermediate layers" as claimed. Looking at Table 1 on col. 6, layers 1-10 correspond to AlAs to GaAs first interface junction (or a first intermediate layer), and layers 13-22 correspond to a GaAs to AlAs second interface junction (or a second intermediate layer). Col. 6 lines 10-20. As is clear from the table, the first intermediate layer has a lower thickness, and higher dopant concentrations than the second. *See also* col. 6 lines 20-23 (first interface thickness 20 nm, second interface thickness 40 nm); col. 6 lines 27-30 (doping concentration of any part of the first interface is higher than doping concentration of any part of the second interface). The only question then is whether the electric field strength of Villareal corresponds to the claims.

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Villareal describes that the electric field is smallest in the in the AlAs to GaAs junction, and that the electric field is low in that transition region. Col. 5 lines 50-59. Conversely, the electric field is high in the GaAs to AlAs interface junction. Col. 5 lines 60-64. The AlAs to GaAs junction is the first intermediate layer, while the GaAs to AlAs junction is the second intermediate layer. *See supra*, the prior paragraph. Thus the first intermediate layer has a low electric field strength, reduced thickness, and high doping concentration, and the second intermediate layer has a high electric field strength, increased thickness, and reduced doping concentration, as claimed.

Thus, Villareal appears to meet the limitations of claims 66, 71, and 77; Villareal must likewise meet the limitations of parent claims 63, 68, and 74, which are merely broader variants of those claims. The examiner does not see how applicant's statements to the contrary can be correct. Applicant does not point out with particularity the differences between Villareal and the claimed invention; applicant merely notes what Villareal does, Remarks at 8-9, states that Villareal is different, Remarks at 9, then notes what the claimed invention does, Remarks at 9-10. That is, applicant states that Villareal "fails to disclose or suggest Applicants' claimed setting of a thickness and doping concentration in correspondence to electric field strength of light within" the DBR. Remarks at 9. Applicant does not state why Villareal does not disclose these features; applicant merely goes on to describe applicant's own disclosed embodiment from the specification. Applicant has done nothing to rebut the prima facie case of obviousness made in the prior action.

Indeed, even the purported differences noted between Villareal and the disclosed embodiment do not seem to be differences. Applicant notes that "with the present invention, it

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becomes possible to reduce the optical absorption of DBR by decreasing the impurity concentration level in the part where the electric field strength of the incoming light is large while minimizing at the same time the problem of increase of resistance . . . by increasing the thickness of the intermediate layer in such a part where the impurity concentration is decreased.”

Remarks at 9-10. It is not apparent how this differs from Villareal. Applicant describes from Villareal: “That area [where electric field is high] is relatively lightly doped to help decrease optical absorption of the locally high electric field. The relatively large thickness of the transition region helps to decrease the electrical resistance without significantly increasing the optical absorption.” Remarks at 9. Thus, in both Villareal and the present invention, in the region where the electric field is high the doping concentration is low in order to decrease optical absorption, but at the same time the thickness is increased in such a region to help to decrease electrical resistance. It is noted that neither optical absorption nor electrical resistance is actually claimed, but in any event the features appear to be the same in applicant’s invention and Villareal.

The only potential problem with Villareal is that the reference may not be explicit that the thickness and doping concentration are “set” to correspond to electric field strength as claimed. However, such a teaching is certainly implicit; given the reasoning described above as to why Villareal’s junctions have the properties which they have, it is clear that the thickness and doping concentrations have values in a particular region due to the electric field strength in said region. The thickness, doping, and electric field strength all work together to achieve the desired result, therefore they may be said to be set to correspond with each other.



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Thus, it is not clear how Villareal and the claimed inventions differ. All of the limitations of the claims appear to be included in Villareal, and indeed even the unclaimed results appear to be the same. The rejections are maintained and this action is made final.

### ***Conclusion***

The rejections above are slightly modified from the previous rejections; applicant's amendment necessitated these modifications. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Menefee whose telephone number is (571) 272-1944. The examiner can normally be reached on M-F 8:30-5.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



James Menefee  
Primary Examiner  
September 29, 2006